Better Vaccines for Healthier Catfish

Heads up, catfish farmers: Like the old joke says, there's good news and bad news about *Edwardsiella ictaluri*, the bacterial culprit behind $20-million annual losses to enteric septicemia of catfish (ESC).

First, the good news: Despite conventional wisdom, plummeting water temperatures don't necessarily have a chilling effect on a vaccinated fish's ability to fend off *E. ictaluri*.

"It's long been thought that if you immunized a fish against *E. ictaluri* and subsequently put it in water that was 66.2°F or cooler, the fish would lose its immunity after about 3 months," says microbiologist Phillip H. Klesius. He heads the ARS Fish Diseases and Parasites Research Laboratory at Auburn, Alabama. "People believed that the fish's immune system became dormant in the colder water."

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Pond-raised catfish. (K5328-10)

Not so, two studies by Klesius suggest. In the first, conducted in 1980, Klesius showed that immunoglobulin production—the manufacture of protective antibodies by the fish's immune system—is not influenced by water temperature.

In more recent tests, Klesius immunized catfish with a live *E. ictaluri* vaccine, then grew the fish in water temperatures of either 66.2°F or 78.8°F. For 4 months, the fish were challenged with exposure to *E. ictaluri* once a month. The result: Immunized fish in the colder water were no more likely to become infected than their counterparts in warmer waters.

"This shows that acquired immunity against ESC is long-lasting at either 78.8 degrees or 66.2 degrees," he says. "We don't know what would happen if water temperature dropped as low as 41°F, for example, but it works at 66°F. This gives the farmer a wider window of opportunity in which to vaccinate against ESC."

Now for the bad news: Choosing a vaccine against *E. ictaluri* may not be as simple as believed in the past.

"Although *E. ictaluri* isolated from various situations have different names, it was not thought that they were actually different," Klesius explains. "For example, the name AL-93-58 simply meant it was the *E. ictaluri* isolated in 1993 from fish in Alabama in clinical case number 58—not that it was actually very different from the isolate known as AL-93-75."

The concept of all *E. ictaluri* being equal was a comforting one because it meant vaccinating with one isolate should protect against any *E. ictaluri* that came along. Studies by Klesius and by Craig A. Shoemaker in early 1996 shattered that illusion.

"We immunized channel catfish with one of five isolates of *E. ictaluri*, then challenged them with other isolates," Klesius recalls. "We found, for example, that immunizing with isolates AL-93-75, EILO, AL-93-58, or S-94-1017 induced immunity against AL-93-75 but that neither ATCC-33202 nor S-94-1051 did.

"It was believed that all *E. ictaluri* produced essentially the same antigens, or proteins that stimulate the fish's body to produce an immune response," says Klesius. "Our results show for the first time that differences exist between *E. ictaluri* isolates in their ability to induce protective immunity against ESC."

Since vaccination with some isolates does protect against others, Klesius thinks it's possible certain isolates share so-called antigen patterns. This might mean a vaccine that carries a specific pattern would protect against isolates that share it.

"Our next step is to work out the predominant antigen patterns among the *E. ictaluri* isolates and work out a vaccine from that," Klesius says. "Just because we've discovered there are differences in the isolates doesn't mean we have to reinvent the wheel here."—By **Sandy Miller Hays**, ARS.

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